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Spallation Neutron Source

Systems Requirements Document for Equipment, Device and Signal Naming

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SYSTEMS REQUIREMENTS DOCUMENT
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January 2000

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LIST OF TABLES

1. PURPOSE

This requirements document documents the equipment, device, and signal naming and numbering to be used for all SNS systems.

2. SCOPE

These requirements applies to all devices (beam instrumentation, sensors, control elements, etc.), equipment (power supplies, magnets, Rf cavities, targets, moderators, instruments, etc.) and signals in technical systems and conventional facilities. These requirements do not apply to cable numbering, pipe numbering, or location designations throughout the facility.

3. Requirements

Format and syntax shall be as shown on Figure 1.

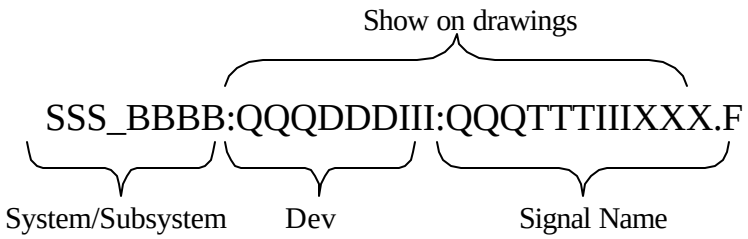

Figure 1: Format and Syntax

Requirements and control of specific naming elements are listed in Table 1 below.

Table 1. Numbering requirements

Naming part	Description	Requirements	Controlled by	Remarks
Format and Syntax	Entire name	Figure 1 and Syntax rules in Table 2	Project Director	
Drawing Numbers	Numbering on drawings	Figure 1. System and subsystem must be shown for equipment in systems not in the system shown on the drawing	Division Director	
SSSS	System	Names on Table 3 Subsystem name on Table 4 may be used if it clearly indicates its system	Division Director	
BBBB	Subsystem	Names on Table 4. May be omitted if subsystem is obvious from system name or device name.	Senior Team Leaders	
QQQQ	Device Qualifier	Use is optional. Qualifiers are assigned by WBS Level 3 task leaders (Could be an associated piece of equipment)	Level 3 Task Leaders	Example: SplTnk for spill tank or HX1_TE101 for temperature element on a heat exchanger.
DDDD	Device Type	Names on Table 5 or IEEE 803 Recommended Practice for Unique Identification in Power Plants and Related Facilities for conventional facilities or assigned by STL.	Table 4 by Senior Team Leader for Global Controls	
IIII	Device Instance	Number per Table 7. Numbers are assigned by Level 3 task leaders	Senior Team Leaders	Example: Tnk101 or SplTnk101 for spill tank
QQQQ	Signal Qualifier	Use is optional. Qualifiers assigned by WBS Level 3 task leaders	Level 3 Task Leaders	
TTTT	Signal Type	Table 6 or assigned by Level 3 Task Leader	Level 3 Task Leaders	
XXXX	Suffix	Use is optional. Qualifiers assigned by WBS Level 3 task leaders ISA Standard S5.1 Instrumentation Symbols and Identification where applicable	Level 3 Task Leaders	
F	Field Name	Used by EPICS software programmers only	STL for Global Controls	

Table 2. Syntax rules

Name part	Syntax rules
Syntax rules for the general naming format	1. The delimiter "_" is used to separate system and subsystem names. The delimiter ":" is used to separate equipment or device name from its system/subsystem prefix. 2. Subsystem names are optional and may be omitted if subsystem is obvious from preceding system name or from succeeding equipment or device name. 3. The first character of each name (SystemName, SubsystemName, etc.) shall be alphabetic. 4. Alphabetic characters "I" and "O" should not be used where they introduce the potential of confusion with the numbers "1" and "0". 5. Letter case shall not be used to distinguish between names. That is, there shall never be two names for which the only difference is letter case. 6. Letter case shall be used to improve readability. The first letter of a word or abbreviation shall be capitalized; succeeding letters shall be lower case. Acronyms shall be all capital letters. 7. The only non-alphabetic characters used shall be ":" and "_". The colon (":") shall be used only as a delimiter between name parts. The underscore ("_") shall not be used as part of the system name and shall be used only as a delimiter prefix in the subsystem name. However in the equipment name "_" can be used as desired to improve readability (but not as a first character).
Syntax rules for Signal Names (See Figure 1)	1. The first character shall be alphabetic. 2. Alphabetic characters "I" and "O" should not be used where they introduce the potential of confusion with the numbers "1" and "0". 3. Letter case shall not be used to distinguish between names. That is, there shall never be two names for which the only difference is letter case. 4. Letter case shall be used to improve readability. The first letter of a word or abbreviation shall be capitalized; succeeding letters shall be lower case. Acronyms shall be all capital letters. 5. The only non-alphabetic characters used shall be "_", which can be used as desired to improve readability (but not as a first character).

Table 3. System codes

WBS	System code	System code description
1.3	FE	Front End Systems
1.3	LBT	LEBT
1.3	MBT	MEBT
1.3	RFQ	RF quadrupole
1.3	Src	Ion source
1.4	Lin	Linac
1.4	DTL	Drift tube linac
1.4	CCL	Coupled cavity linac
1.4	SCL	Superconducting linac
1.4	CHL	Central Helium Liquefier
1.5	HBT	HEBT
1.5	Rng	Ring
1.5	RTBT	RTBT
1.6	Tgt	Target systems
1.6	EDmp	Ring extraction dump
1.6	IDmp	Ring injection dump
1.6	LDmp	Linac dump
1.7	ISF	Instrument Support Facilities
1.7	Instr	Instruments
1.8	CF	Conventional Facilities
1.8	ELC	Power and communication systems
1.8	MECH	HVAC and utilities systems
1.8	WSTE	Waste systems
1.9	ICS	Integrated Control System
1.9	PPS	Personnel Protection System

Table 4. Subsystem codes

Subsystem code	Subsystem description
Accl	Accelerator
Cryo	Crogenics
Ctl	Control system
CWS	Chilled Water System
Diag	Diagnostics
DIWS	Deionized Water System
Extr	Extraction
Gen	General
Inj	Injection
Mag	Magnets
PS	Power Supply
RF	RF systems
Tim	Timing
Vac	Vacuum
Bnch	(MEBT) buncher
S3B	(MEBT) section 3, Part B
Mod1AL	(RFQ) module 1, Part A, Left
Mod4DB	(RFQ) module 4, Part D, Bottom
Mod	Target module
Proc	Target process systems
Hg	Target mercury loop
Tran	Target transport systems
Amb1	Ambient-temp. moderator #1 (for system TMod)
Amb2	Ambient-temp. moderator #2 (for system TMod)
Cry1	Cryogenic moderator #1 (for system TMod)
Cry2	Cryogenic moderator #2 (for system TMod)
In	Reflector inner plug (for system TRef)
Mid	Reflector middle plug (for system TRef)
Out	Reflector outer plug (for system TRef)
Core	Core vessel (for system TVes)
Win	Proton beam window (for system TVes)
Upr	Upper vessel (for system TVes)
Bulk	Bulk shielding components (for system TSh)
Shel	External shell (for system TSh)
Shtr	Shutter systems (for system TSh)
BL1	Neutron beam line #1 (for system TSh)
Roof	Target roof structure (for system TSh)
DIWS	Deionized cooling water subsys. (for system TUtl)
PWCS	Proton window cooling water subsys. (for sys TUtl)
D2O	Heavy water cooling subsys. (for system TUtl)
CCS	Cryo moderator shld. cooling subsys (for sys TUtl)
TCS	Target ass'y/shroud cooling subsys (for sys TUtl)
MCS	Ambient moderator cooling subsystem (for sys TUtl)
Vac	Vessel vacuum subsystem (for sys TUtl)
He	Helium gas subsystem (for sys TUtl)
Cell	Maintenance shell subsystems (for sys TRH)
Bay	High-bay maintenance subsystems (for sys TRH)
BL	Beamline maintenance subsystem (for sys TRH)
Vlt	Utility vault maintenance subsystem (for sys TRH)
LDmp	Linac beam dump maint subsys (for sys TRH)
IDmp	Ring injection dump maint subsys (for sys TRH)
EDmp	Ring extract dump maint subsys (for sys TRH)

Subsystem code	Subsystem description
CR	Remote handling control room (for sys TRH)
TMod	Target moderator systems
TRef	Target reflector assemblies
TRH	Target remote handling
TSh	Target station shielding
TUtl	Target utility systems
TVes	Vessel assemblies
BmLn	Incident instrument beam line
Chop	Neutron beam chopper
FltPth	Flight path
Guide	Instrument neutron guide tubes
Samp	Sample chamber
DAS	Data Acquisition System
Inel1	Spectrometer, microvolt
Inel2	Spectrometer, 100 microvolt
Inel4	Spectrometer, wide angle chopper
Inel5	Spectrometer, large solid angle single crystal
Pow3	Powder diffractometer, long wavelength
Pow6	Powder diffractometer (strain; high resolution)
Pow7	Powder diffractometer (for glasses and liquids)
Ref1	Reflectometer, vertical refl. plane
SANS2	Small angle neut scattering, Gen/lower Q high res
SCD1	Diffractometer, general purpose single crystal
B01	Bldg no. 8001 (typical format for any bldg no.)
LinTnl	Linac tunnel
RngTnl	Ring tunnel
Tnl	Pertaining to tunnels
Tgt	Pertaining to target building
Site	Site (e.g. PPS site rad monitors)
SubSt	Electrical substation
CCR	Central Control Room
BHWS	Building Heating Water System
CA	Compressed air system
CWS	Chilled Water System
DCW	Deionized Cooling Water System
DWS	Demineralized Water System
Elec	Electrical power and communication systems
FCryo	Facility cryogenic systems
FGas	Facility gas distribution systems
FVac	Facility vacuum system
GWTS	Gaseous waste treatment systems
HVAC	Heating, ventilation, and air conditioning systems
LLLW	Liquid low-level waste treatment systems
NG	Natural gas systems
PWS	Process Water System
PWTS	Process waste treatment sytems
SWS	Sanitary Water System

Table 5. Device type

Device code	Device code description
AHU	Air handling unit
ANPS	Anode power supply
BCM	Beam current monitor
BIG	Beam in gap monitor
Bldg	Building
BLM	Beam loss monitor
BPM	Beam position monitor
BPMH	Beam position monitor, horizontal
BPMV	Beam position monitor, vertical
Cab	Instrument and control cabinets
Cbl	Cable
Cav	RF cavity
CCG	Cold cathode vacuum gage
Colim	Collimator
Damp	Damper
DCBPM	DC beam position monitor
DCH	Dipole magnet, corrector, horizontal
DCV	Dipole magnet, corrector, vertical
DEC	Decapole magnet
DH	Dipole magnet, horizontal
Dr	Door
DV	Dipole magnet, vertical
EKick	Extraction kicker
Fan	Fan
FBCM	Fast Beam Current Monitor
FBLM	Fast Beam Loss Monitor
Flt	Filter
FV	Fast valve
GBPS	Grid bias power supply
HX	Heat exchanger
IG	Ion gage
IKick	Injection kicker
IP	Ion pump
IX	Ion exchanger
Mix	Agitators, mixers
Mo	Motor
Mod	Modulator
MV	Manual valve
NEGP	Non-evaporable getter pump
OCT	Octupole magnet
OctH	Octupole magnet, horizontal
OctV	Octupole magnet, vertical
PA	Power amplifier
PADPS	Power amplifier driver power supply
Pen	Penetration
Pipe	Pipe
Pmp	Pump
PrM	Beam profile monitor
PrMH	Beam profile monitor, horizontal
PrMV	Beam profile monitor, vertical
Q	Quadrupole magnet
QH	Quadrupole magnet, horizontal
QS	Quadrupole magnet, skew

Table 5. Device type (continued)

Device code	Device type description
QSH	Quadrupole magnet, skew, horizontal
QSV	Quadrupole magnet, skew, vertical
QV	Quadrupole magnet, vertical
Rg	Regulator
RGA	Residual gas analyzer
RP	Roughing pump
RV	Roughing valve
Scrp	Scraper
SGV	Sector gate valve
Sh	Shield
SPS	Screen power supply
SX	Sextupole magnet
SXH	Sextupole magnet, horizontal
SXS	Sextapole magnet, skew
SXSCH	Sextupole magnet, skew, corrector, horizontal
SXSCV	Sextupole magnet, skew, corrector, vertical
SXSH	Sextupole magnet, skew, horizontal
SXSV	Sextupole magnet, skew, vertical
SXV	Sextupole magnet, vertical
TCG	Thermocouple vacuum gage
Tk	Tanks, receivers
TMP	Turbomolecular pump
TNR	RF tuner
TPS	Tuning power supply
TSP	Titanium sublimation pump
Twr	Tower
Vlt	Vault
Vlv	Valve
VS	Vacuum sector
Vsl	Vessel
WCM	Wall current monitor
WvG	Waveguide

Table 6. Signal type

Signal code	Signal code description
B	Field
Clk	Clock
Cmd	Command (e.g. start/stop)
Ctl	Control (e.g. on/off)
Dr	Door (e.g. interlock)
DP	Differential pressure
Flw	Flow (just analog or either analog/digital?)
Fn	Function
G	Gain
Hor	Horizontal (e.g. BPM horizontal position)
Ver	Vertical (e.g. BPM vertical position)
Hall	Hall probe
I	Current
Cur	Beam current
Lim	Limit
Lk	Leak
Lv	Level
OI	Over-current
OT	Over-temperature
OV	Over-voltage
P	Pressure
pH	pH
Pos	Position
UPos	Upstream position (e.g. collimator upstream pos)
Pw	Power
Rd	Radiation
Spd	Speed
Sts	Status
Tm	Time
T	Temperature
V	Voltage
DPos	Downstream position (e.g. collimator downstrm pos)
Pr	Profile (vector or array) (e.g. horiz profile mon)

Table 7: Instance Numbering

Subproject	Instance Numbering
Front End	Some devices span all the Front End subsystems and therefore will appear as generic "Front End" devices. Examples from Front End: FE_Vac:IG01 Front end; Ion Gauge 1 FE_Vac:VLV02 Front end; Valve 2 FE_Vac:IP03 Front end; Ion Pump 3 FE_Cool:H20_4 Front end; H20 loop 4 Most devices are associated with particular subsystems, and follow the general guidelines. Examples from Source: Src1:Ovn Source 1; Oven Src1:RF Source 1; RF Examples from LEBT: LBT1:Chop1V LEBT 1; Chopper 1, Vertical LBT1:L3V LEBT 1; Lens 3, Vertical Examples from MEBT: MBT1:QH01 MEBT1; Quad 1, Horizontal MBT1:Scnr02 MEBT1; Scanner 2 MBT1:Bnch MEBT1; Buncher MBT1:BPM03 MEBT1; Beam Position Monitor 3 MBT1:FC04 MEBT1; Faraday Cup 4 Examples from RFQ: RFQ1:Kly RFQ1; Klystron RFQ1_Mod1AL:Tnr RFQ1; Module 1, Section A, Left; Tuner
Linac	The linac is divided into ever smaller components as follows: modules, segments, cavities, cells. The arrangement of modules may change in some SNS upgrade scenarios, however the numbering of segments increases continuously, independent of DTL, CCDTL and CCL boundaries, and independent of possible reconfigurations of the rf power. Also, magnetic lattice elements and beam instruments are located between segments. For these reasons, linac devices will be instantiated using the number of the *preceding* segment. For example: CCL:QH122 Horizontally focusing quadrupole after segment 122 CCL:BPM122 Beam position monitor located after segment 122 CCL:QH123 Horizontally focusing quadrupole located after 123 CCL:PS_QH123 Power supply powering QH123 CCL:QV124 Vertically focusing quadrupole after segment 124 CCL:DCV124 Vertical Steering Magnet (Dipole Corrector -

	Vertical) after segment 124 CCL:Tor124 Toroid located after segment 124 CCL:PrMH125 Horizontal Profile Monitor after segment 125 CCL_Vac:IG156 Ion Gauge located after segment 156
Ring	Ring magnets and power supplies instances will be assigned as follows. The ring lattice consists of four superperiods, each containing a 90 degree arc and a long straight section. The four superperiods are labeled A, B, D, and run sequentially along the beam direction from the beginning of one arc to the beginning of the next. The order of magnets in each superperiod X is DHX1, QVX1, …,QHX10, QVX11, QHX12 where D and Q denote dipoles and quadrupoles, and H and V refer to the horizontal and vertical planes. The long straight sections in superperiod X run from QHX8 through QHX12. Devices in the beam transport lines will be labeled similarly except that there will be no superperiod. Devices will be numbered sequentially from a starting point. Examples of Ring power supply devices follow: Rng1_PS:DVA3 Ring, Power Supply, Dipole Vertical, superperiod A, #3 Rng1_PS:QHB1 Ring, Power Supply, Quadrupole, Horiz., superperiod B, #1 Rng1_PS:DCHA4 Ring, Power Supply, Dipole Corrector Horiz, #4 Instance designations for ring equipment not directly related to a specific ring or transport line location will be simply assigned a sequential number. Examples of ring vacuum devices: Rng1_Vac:FV1 HBT_Vac:IP3 RTBT_Vac:SGV2 Ring1_Vac:TSP2 Examples of ring diagnostic devices: Rng1_Diag:BCM1 Ring, Diag, BCM, #1 Rng1_Diag:BLM5 Ring, Diag, BLM, #5 Rng1_Diag:BPMH1 Ring, Diag, BPMH, #1 Examples of ring RF devices: Ring1_RF:Cav Ring1_RF:PA Examples of other ring devices: HBT:Colim1 HEBT, Collimator#1 HBT:Colim2 HEBT, Collimator#2 Downstream position

<table>
<tr><td>Target Systems</td><td>The device and instance naming convention should be based on the convention in IEEE 803.1. Instance numbers should be as follows:

<table>
<tr><th>WBS</th><th>NAME</th><th>NUMBERS</th></tr>
<tr><td>WBS 1.6.1</td><td>Mercury loop</td><td>5000 – 5499</td></tr>
<tr><td>WBS 1.6.2</td><td>Moderator</td><td>6000 – 6999</td></tr>
<tr><td>WBS 1.6.3</td><td>Reflector</td><td>7000 – 7499</td></tr>
<tr><td>WBS 1.6.4</td><td>Vessel</td><td>7500 – 7999</td></tr>
<tr><td>WBS 1.6.5</td><td>Shielding</td><td>8000 – 8499</td></tr>
<tr><td>WBS 1.6.6</td><td>LWS1</td><td>1000 – 1499</td></tr>
<tr><td>WBS 1.6.6</td><td>LWS2</td><td>1500 – 1999</td></tr>
<tr><td>WBS 1.6.6</td><td>LWS3</td><td>2000 – 2499</td></tr>
<tr><td>WBS 1.6.6</td><td>D2O</td><td>2500 – 2999</td></tr>
<tr><td>WBS 1.6.6</td><td>Helium</td><td>3000 – 3499</td></tr>
<tr><td>WBS 1.6.6</td><td>Vacuum</td><td>3500 – 3999</td></tr>
<tr><td>WBS 1.6.7</td><td>Remote H.</td><td>4000 – 4999</td></tr>
<tr><td>WBS 1.6.8</td><td>TPS</td><td>5500 – 5999</td></tr>
<tr><td>WBS 1.6.9</td><td>Linac dump</td><td>9000 – 9299</td></tr>
<tr><td>WBS 1.6.9</td><td>Beam inj. Dmp</td><td>9300 – 9599</td></tr>
<tr><td>WBS 1.6.9</td><td>Beam ext. dmp</td><td>9600 – 9999</td></tr>
<tr><td></td><td>Miscellaneous</td><td>0000 – 0999</td></tr>
<tr><td>WBS 1.9.6</td><td>Control</td><td>8500 – 8999</td></tr>
</table>

The offgas and waste handling equipment should be included with one of these loops. Use the miscellaneous category for equipment not included with other systems.

Based on this a pressure gauge in the utility loop LWS1 would be the following:
Tgt_LWS1:Device1Instance, for example a tank in loop LWS1 would be
Tgt_LWS1:Tk1001
A pressure instrument connected to the tank could be named
Tgt_LWS1:PE1002</td></tr>
<tr><td>Experiment Systems</td><td>Systems in support facilities should use the instance numbering technique used for conventional facilities process instrumentation. For equipment and devices associated with neutron beam lines or instruments, the first digit in the instance number should indicate the beam line or instrument number.</td></tr>
<tr><td>Conventional Facilities</td><td>Equipment and associated “Tag Names” should be named according to IEEE 803, IEEE Recommended Practice for Unique Identification in Power Plants and Related Facilities, which references the Instrument Society of America (ISA) Standard S5.1 (“Instrumentation Symbols and Identification”).

Instance number ranges will be assigned to appropriate subsystems as part of the review and comment effort.</td></tr>
</table>